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Climate change behaviors related to purchase and use of personal cars: Development and validation of eco-socially conscious consumer behavior scale

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ABSTRACT

A constantly changing environment and global warming are issues that are recognized at all global forums. One of the major reasons for global warming is the emission of greenhouse gasses which is primarily caused by use of personal cars as means of transport. This study reports on the development of an eco-socially conscious consumer behavior (ESCCB) scale specific to purchase and use of personal cars, based on samples of actual automobile customers in Pakistan. Using mixed method approaches, the results of 3 studies yield a 9-item three-dimensional scale (eco-social conservation, eco-social use, and eco-social purchase) with satisfactory reliability, construct validity and nomological validity. Second-order factor analysis revealed that eco-social purchase was the most important dimension, followed by eco-conservation and eco-social use. A test of nomological behavior shows that the scale is positively associated with a related construct: environmental concern. This study advances the literature on pro-environmental behaviors by introducing a conceptual definition of ESCCB related to personal car purchase and use, developing a measure for the ESCCB concept and validating the scale in the context of an emerging economy, Pakistan. The scale provides important insights for marketers in the automobile industry for remodelling marketing plans, as well as for environmentalists focusing on strategies to bring change in consumer behavior.

1. Introduction

Climate change is a globally recognized concern. Greenhouse gas (GhGs) emissions contribute to global warming and climatic change (De Richter et al., 2016; Shah, 2015). One of the most heavily emitted anthropogenic greenhouse gasses is carbon dioxide (CO_2), produced primarily by the burning of fossil fuels (USEPA, 2015). The International Energy Agency (IEA) reports that the largest cause of CO_2 emissions (90%) is energy consumption (IEA, 2015). Consumption of energy is closely associated with the growth rate of countries - higher growth rates being positively correlated with more consumption. The dynamics of this link between economic growth and increased energy consumption are a necessary feature of increased industrial activity.

The transport sector plays a vital role in countries' growth as economic activity fuels transport demand, serving the needs of both freight and passengers transportation. Energy consumed in transportation largely (95%) comes from using highly CO_2-emitting oil-based fuels. It is estimated that 44.5% of emissions are contributed by light duty vehicles (passenger cars) alone (IPCC, 2004). In emerging economies, due to economic stability and growing populations, the use and purchase of personal cars is increasing, resulting in higher emissions of CO_2 (IPCC, 2004).

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While increases in travel and possession of personal cars are an unavoidable aspect of increased economic growth, the rate of emissions and use of fossil fuels can still be mitigated against and the impact thereof reduced. Energy efficient vehicle technologies and minimizing the use of personal cars may help to reduce the impact of growing travel energy consumption on the environment (Arne et al., 2015; Herring and Sorrell, 2009). However, consumer behavior related to the purchase and use of personal cars encompasses a complex set of decisions contingent upon product need perceptions, cultural traits, values, norms, and efforts to promote pro-environmental behaviors (Brand et al., 2013; Marc and Barbara, 2013; Steren et al., 2016). An important consideration for researchers is conceptualizing the nature of behavior related to transport decisions. We report on the development of a consumer behavior measurement instrument examining purchase and use of personal cars in the context of an emerging economy of South Asia, Pakistan.

2. The context

Pakistan is a rapidly growing country with a population growth rate of 1.46% per annum (as of 2015) and an average economic growth rate of 4.06% per annum in the period 2011–2016 (CIA, 2015). The country currently faces several environmental issues, of which air pollution from vehicular exhausts and increasingly and uncharacteristically volatile weather patterns are of major concern (CIA, 2015). Numerous studies indicate that environmental pollution due to increasing CO_2 emissions in emerging economies is escalating as it has in the developed world (Afroz et al., 2015; Beck et al., 2013), warranting investigation in emerging economies like Pakistan. A study conducted in the context of CO_2 emissions in Pakistan reported that 60%-70% of environmental pollution comes from vehicular exhausts, 81% of which being contributed by motor cars under individual and household use (Ilyas, 2007).

The automobile market in Pakistan is growing rapidly. According to the Pakistan Automotive Manufacturers Association (PAMA), the total number of personal cars sold during 2014–2015 was 152,524 units, in comparison with 118,102 units during 2013–2014: a growth of almost 30% (PAMA, 2015). This growth is due to increased purchasing power, stable fiscal policy, improved economics in the automobile sector and the overall recovery of the economy from the 2007–2008 global financial crisis (Aftab, 2016). The Government has recently approved an auto development policy, incentivizing new entrants by reducing duties and taxes in order to encourage foreign direct investment which is expected to further accelerate sales of personal cars (EDB, 2016; Rana, 2016).

Constantly changing climate and changing patterns of consumer behavior in Pakistan may combine to create a unique risk situation, arising out of severe natural hazards. A recent study posited that countries in south Asian region, especially Pakistan and India, are expected to face deadly heat waves posing severe threats to people in the latter part of the 21st century if greenhouse emissions are not controlled and climate change impacts are not mitigated (Im et al., 2017). Given that the transport sector, and the personal car segment specifically, contribute significantly to CO_2 emissions, an early intervention is inevitable to promote eco-social behavior related to the choice and use of personal cars. It is therefore important to understand consumer behavior as related to purchase and use of personal cars through the development of a measurement instrument in order to guide applicable policy creation, taking into account socio-cultural differences between developed and developing countries.

3. Pro-environmental behaviors and gaps in existing measurement scales

The extant literature puts forth numerous scales to measure general pro-environmental behaviors, however, these only partially capture elements of specific behaviors related to purchase and use of personal cars. Drawing upon the recommendation of Kaiser (1998), that '*…whether the goal of the research is behavior change or the evaluation of different determinants of ecological behavior, the accurate measurement of ecological behavior is a precondition…*', an analysis of existing scales measuring environmental behaviors is presented to identify neglected areas, leading to the development of a new scale measuring eco-socially conscious consumer behavior (ESCCB) specific to purchase and use of personal cars.

3.1. The Ecologically Conscious Consumer Behavior (ECCB) scale

The ECCB construct was first proposed by Roberts (1991) and later refined by Tilikidou (2001). The core concept of the ECCB was based on 3 dimensions, namely the '*cognitive dimension'*, the *'affective dimension'*, and the *'behavioral dimension'* (Tilikidou, 2001). A final version of the instrument contained 4 dimensions: *'pro-environmental purchase behavior'*, '*pro-environmental activities*', *'pro-environmental attitudes*', and '*recycling attitudes*' (Tilikidou, 2002).

An inherent issue with the ECCB scale is the number of items used to measure the concept. Due to the great number of items, the scale lacks precision because of redundancy and suffers from non-response during application. Therefore researchers have used only subscales of this instrument in their studies (Fraj and Martinez, 2006; Khare, 2014). The ECCB scale reports only one item relevant to this current study, that of *'I avoid using my car unless it is absolutely necessary'* (Tilikidou, 2002).

3.2. The General Ecological Behaviors (GEB) scale

Since ecological behaviors are distinct in nature and behave differently from one context to other, no single metric can be devised to measure all types of ecological behaviors. However, subscales representing different ecological behaviors with reasonable correlation can be utilized to measure general pro-environmental behavior. The GEB scale developed by Kaiser (1998) presents an example of scale to measure several pro-environmental behaviors. The GEB scale consists of 38 items and with 7 distinct dimensions (Kaiser, 1998).

In the context of current research, this scale contains a noteworthy dimension: that of '*ecological automobile use',* which includes 5 items measuring the use of public transport or sustainable intercity use of personal cars (Kaiser, 1998). Although this subscale attempted to measure the behavioral perspectives of sustainability in the use of automobiles, its scope was limited to a few aspects including use of public transport, driving at a particular speed, and using an environment-friendly types of fuel (Kaiser, 1998). Nonetheless, during the process of item pool generation for the current study, these elements were used to reflect aspects of sustainable behaviors related to car use.

3.3. The Stanford Climate Change Behavior Survey (SCCBS)

The SCCBS was developed by Armel et al. (2011) to assess behavior towards GHG emissions. The 97-item scale measured individual level behaviors of 4 different categories: transportation, food, waste management and electricity usage. This is a comprehensive survey that covers all aspects of individual behaviors related to GHG emissions. Interestingly, the survey measured transportation related behaviors in detail, including *'carpooling, 'using public transport', 'driving energy efficient vehicles', 'maintaining vehicles for better environmental performance'* and *'using bicycles instead of cars for short trips'* (Armel et al., 2011).

Though the SCCBS provides a comprehensive account of consumer behaviors related to GHG emissions, 2 key shortcomings may limit its applications. First, the scale was tested on a student sample which has been excessively criticized for being a too '*narrow-database*' in the generalizability of study results (Sears, 1986). Second, there are too many scale items: only subscales can be utilized to ensure an adequate response rate. Nevertheless, our study utilized the findings of SCCB and includes some of its items for pilot testing during deductive process of item generation.

The brief account of several scales related to ESCCB provided above and the detailed description outlined in Table 1 show that the majority of scales are developed in Western contexts or in developed countries, where socio-cultural dynamics facilitating certain behaviors are different from developing countries. Moreover, the comprehensive description of ESCCB related to choice and use of personal cars cannot be found in any single instrument. It is therefore viable to conceptualize and develop a new measure of ESCCB in which can be applied to developing economies' context.

The following sections of this article discuss the methodology involved in development of the ESCCB scale, the analysis of primary data from actual consumer market, and the findings of the study.

4. Methods

We drew upon the 7-step scale development process proposed by Churchill (1979). Initially, a conceptual domain of ESCCB was defined based on ideas manifested in sustainability marketing and social marketing research. Later on, using semi-structured interviews and literature analysis, a pool of items representing eco-social behavior specific to purchase and use of personal cars was generated. To ensure that quality of data was maintained, the generated items were translated into Pakistan's native language, Urdu. After translation, the instrument was administered to a national sample of automobile customers. Finally, the collected data was analyzed to establish reliability and validity of the ESCCB scale.

The remainder of this article is divided into 3 studies. The first study (study 1) involved procedures to generate and purify an initial pool of items (n = 174) on the basis of corrected inter-item correlation. Subsequently, data obtained in study 2 (n = 400) was utilized to perform exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to examine factor structure, as well as to provide evidence of reliability and validity of the construct. Finally, results of study 3 (n = 549) are reported in order to discuss nomological validity of the scale with a related construct, environmental concern.

4.1. Conceptualization of Eco-Socially Conscious Consumer Behavior (ESCCB)

Consumer ecological behaviors are conceptually similar to social behaviors as both pertain to a wider domain – ethical behavior (Eagle and Dahl, 2015; Kumar et al., 2013). Ethical behavior is motivated by a number of factors including morality, religiosity, environmental awareness, social consciousness, and patriotism (Belz and Peattie, 2012; Eagle and Dahl, 2015). In general, the same motivations drive both ecological and social behaviors (Belz and Peattie, 2012). However, there are certain paradigmatic distinctions which distinguish the conceptual measurement of social behavior scales from those of ecological behavior scales, which are mainly related to their differing end-goals. Social marketing entails programs aiming to change behavior at individual, community, and society levels across diverse sectors (Belz and Peattie, 2012). Social behaviors, therefore, explain social change in consumer behavior at both micro and macro levels to the extent that they enhance societal well-being. On the other hand, ecological marketing deals with the impact of marketing activities on the environment and deliberate behaviors like energy conservation and environmental protection (Autio et al., 2009; Narula and Desore, 2016). During the late 20th century, ecological marketing evolved and branched into environmental marketing and sustainability marketing. These fields encompass a diverse range of issues including conservation of natural resources, maintenance of biodiversity and protection of the environment (Belz and Peattie, 2012; Dahlstrom, 2010). Both social and ecological behaviors lead to sustainable consumer behaviors. Sustainability is a micro/macro concept that asserts the importance of sustainable development by focusing on marketing practices, and addresses the interdependence of sustainability with individuals, communities, institutions, societies, stakeholders, and consumers, including future generations (Belz and Peattie, 2012). Hence sustainable behavior embraces a wider perspective explicating how consumption can be regulated by norms to protect the environment and conserve natural resources.

The purchase of environmentally-friendly cars and their sustainable use is comprised of both concepts – ecological and social

Table 1
Overlaps and similarities of ESCCB scale with related constructs.

Scale Name	Setting	Scale Description	Domain of Overlap with ESCCB
New Environmental Paradigm ($NE_{nv}P$)	USA	The 12-item 'New Environmental Paradigm scale' is unidimensional. It demonstrated satisfactory internal reliability as well as predictive, content and construct validities among two samples i.e. General Public Sample (GPS) and Environmental Organization Sample (EOS). The items of the scale reflected the inherent concepts of balance of nature, limits to growth and human domination (Dunlap, 2008)	Eco-Social use: • Using telecom instead of personal cars for business when possible • Wisely planning routes to avoid traffic congestion Eco-Social Conservation: • Avoiding tailgating and air-conditioning to save fuel
ECOSCALE	USA	ECOSCALE is 31-items measure of environmentally conscious consumer. The seven dimensions of ECOSCALE include: opinion and beliefs, awareness, willingness to act, attitude, action taken, ability to act and knowledge (Stone et al., 1995)	Eco-Social Purchase: • Buying and using small displacement car (SDC) for environmental reason
Socially Responsible Consumer Behavior (SRCB)	USA	A 26-items scale consisting of two dimensions: Ecologically conscious consumer behavior (ECCB) (18-items) and socially conscious consumer behavior (SCCB) (8-items). The scale measured both ecological and social perspectives of consumer behavior in relation to environment (Roberts, 1995, 1996)	Eco-Social Purchase: • Buying a hybrid car with automatic transmission which has better environmental performance Eco-Social Use: • Walking for short distances • Carpooling whenever possible
Motivation Towards Environment Scale (MTES)	Canada	A 20-item measure of motivation act pro-environmentally revealed five dimensions: intrinsic motivation, integrated regulation, identified regulation, introjected regulation, external regulation and motivation (Pelletier et al., 1998)	Eco-Social Conservation: • Self-directed and motivated behavior towards car maintenance to ensure better environmental performance
General Ecological behavior (GEB)	Switzerland	A 38-item measure with seven dimensions including, prosocial behavior, ecological garbage removal, water and power conservation, ecologically aware consumer behavior, garbage inhibition, volunteering in nature protection activities and ecological automobile use, was tested om Swiss transportation associations which yielded satisfactory score on reliability and validity (Kaiser, 1998)	Eco-Social use: • Avoiding to use personal car in peak hours to avoid traffic jams which cause pollution
New Ecological Paradigm (NEP)-Revised	USA	The original multi-faceted New Ecological Paradigm (NEP) or Worldview consisted of three dimensions: balance of nature, limits to growth and human domination of nature, initially. Later on, one factor 15-item revised NEP measure was introduced having satisfactory internal reliability. The 'NEP-Revised' consisted of 15-items measuring the endorsement of ecological worldview (Dunlap et al., 2000)	Eco-Social Use: • Avoiding to install accessories that create friction and consume more energy Eco-Social Conservation: • Avoid excessive or unnecessary travelling • Use of technology to substitute travelling
General Ecological behavior (GEB)- Revised	USA	The original GEB scale was modified from 38-items to 51-itmes scale on same seven dimensions and was tested in USA to assess cross cultural validity. Scale yielded satisfactory reliability and validity (Kaiser and Wilson, 2000)	Eco-Social Use: • Keeping the car eco-friendly to avoid air pollution
Environmentally Responsible Behavior (ERB)	Japan	A 25-items unidimensional ERB scale measured various pro-environmental behaviors including recycling, water conservation, electricity conservation, environmental protection, pro-environmental purchases, and use of eco-labeled products (Iwata, 2001)	Eco-Social Purchase: • Buying a hybrid car with claims of better environmental performance Eco-Social Conservation: • Avoiding use of energy consuming car accessories
Ecologically Conscious Consumer Behavior (ECCB)	USA	The construct primarily consisted of three key dimensions, i.e. cognitive dimension, affective dimension and behavioral dimension. Cognitive dimension was measured by Environmental knowledge, affective dimension by pro-environmental attitudes and recycling attitudes, and behavioral dimension by pro-environmental purchase behavior, pro-environmental post purchase behavior and pro-environmental activities (Roberts, 1991; Tilikidou, 2001)	Eco-Social Purchase: • Pro-environmental purchase and willingness to pay high for environment friendly products
Nature Relatedness (NR) Scale	Canada	A 21-item scale measured human nature relation on three distinct dimensions: NR-Self, NR-Perspective and NR- Experience (Nisbet et al., 2009)	Eco-Social Conservation: • Ethical use of natural resources to manage the balance in natural ecosystem
Personal Pro-Environmental Behaviors(PPEB)	USA	PPEB was 6-item unidimensional self-report scale measuring perspectives of transportation energy conservation, natural resources conservation, recycling	Eco-Social Purchase: • Buying environmentally friendly products Eco-Social Conservation: (*continued on next page*)

Table 1 (*continued*)

Scale Name	Setting	Scale Description	Domain of Overlap with ESCCB
		and purchase of environmentally friendly products (Walton and Austin, 2011)	• Reduced use of transport to conserve energy
Stanford Climate Change Behavior Survey (SCCBS)	USA	A 97-item survey consisting of four major climate relevant behavioral categories i.e. Transportation, Food, Waste and Electricity, was established with 10 sub categories (Armel et al., 2011)	Eco-Social Conservation: • Saving fuel by using fuel efficient vehicles Eco-Social Use: • Using bicycle for commuting
Pro-environmental Behavioral Scale (PEBs)	USA	A 19-item scale consisting of four subscales: Conservation, Environmental Citizenship, Food and transportation was developed having satisfactory internal reliability and validity. Test retest correlations proved that the scale was reliable in measuring the underlying concepts (Markle, 2013)	Eco-Social Use: • Using alternate transportation means to avoid use of personal cars
Ethically Minded Consumer Behavior (EMCB)	UK, Germany, Hungary, Japan	EMCB 10-items scale consisted of 5 distinct dimensions: Ecobuy, Ecoboycott, Recycle, Paymore, and CSRboycott, incorporating items from ecological and social perspectives based on self-report actual behaviors. The construct showed consistency across five nations' sample (Sudbury-Riley and Kohlbacher, 2016)	Eco-Social Purchase: • Buying products with least detrimental impact on environment

behaviors. In addition, these 2 concepts combine to form the foundation of environmental behavior, which support sustainable development (Dahlstrom, 2010). In isolation, neither ecological nor social behaviors can ensure sustainability. For instance, improvements in technology may help to protect the environment, but alone will not ensure sufficient conservation of resources. Environmentally friendly technologies may negatively affect resource conservation as (for reasons of economic efficiency) the use of these technologies increases; a phenomenon known as the '*Jevons Paradox*' or the *'Rebound Effect'* (Jevons, 1906; Saunders, 1992). The rebound effect exists in many contexts: Sellen and Harper (2002) reported that, contrary to expectations regarding paperless offices, paper use increased by 14.7% in the USA during 1995–2000. Similar findings were reported in the energy sector and the automobile industry (Arne et al., 2015; Galvin, 2016; Grant et al., 2016; Herring and Sorrell, 2009; York, 2006). These studies indicate that improving technology alone may not sufficiently contribute to long-term sustainability objectives, which justifies seeking deeper understanding of consumer behavior both from an ecological as well as social perspective.

4.2. Qualitative study for item generation and content validity

This study followed both deductive and inductive approaches for the generation of the items pool. Firstly using a deductive approach, the literature pertaining to environmental marketing and sustainability issues was used as reference to extract potential items for further analysis. Following the approach adopted by Flatten et al. (2011), the literature review was conducted by screening all articles published in twelve environmental and social science journals (*Journal of Environmental Psychology, Climatic Change, The Journal of Environmental Education, Journal of Social Issues, Journal of Applied Social Psychology, Environment and Behavior, Social Behavior and Personality, Human Ecology, Journal of Marketing Theory and Practice, Journal of Business Research, Journal of Business Ethics, Psychology and Marketing)* from 1990 to 2016 to identify related constructs that provided measurement for pro-environmental behaviors similar to ESCCB. Journals were selected based on their strong relevance with environmental marketing topics and their scope encompassing consumer behavior and sustainability. The rationale behind choosing the time frame is that sustainability research actively emerged on academic horizon in 1990, and the study started data collection in December 2016. We focused only on studies that proposed instruments for measurement of ecological behavior with some dimensions relevant to and having overlap with ESCCB. As a result 14 studies were selected (see Table 1) and analyzed. Based on existing practice, the relevant items were chosen as initial pool in scale development process of ESCCB (Flatten et al., 2011; Hinkin, 1995).

After the deductive approach, an inductive approach was employed and 5 semi-structured focus group interviews were conducted, each involving 7 participants: 3 automobile industry marketers, 2 researchers from academia working in marketing faculties, and 2 managers working in the non-governmental organization (NGOs) sector engaged in environmental protection initiatives (25 men and 10 women; age range 35–50 years). The participants were provided with information summarizing the project and its scope. During interviews, 6 questions were asked and the participants were engaged in a moderated discussion. Questions were related to concepts regarding environmentally-friendly cars: firstly, the factors affecting their purchase and use, and ways to encourage their purchase and use; and secondly, participants' perception of the impact of use of personal cars on the environment

Interviews were audio recorded and later transcribed for analysis. Analysis was carried out using Leximancer v. 4.5 (Smith and Humphreys, 2006). Three major themes emerged with a number of underlying concepts. The concepts were cross-matched with the literature analyzed using deductive approaches, and the irrelevant concepts were deleted (Crofts and Bisman, 2010; Smith and Humphreys, 2006). Finally, 51 items were produced as a result of the analyses. Content validity of the exhaustive list of items was checked. Three experts (one each from industry, the NGO sector, and academia) reviewed the items for content relevance and clarity

of wording. Consequently, 9 items containing colloquial ambiguity, highlighted by the experts, were reworded. The process led to the refined version of 51 items that was subject to translation and was used for the initial data collection.

4.3. Translation of initial pool of items

The purpose of this study was to develop a scale that could be administered at national level across Pakistan and validated for an actual customers' population with varying educational background and limitations in understanding foreign language. It was thus deemed appropriate to translate the questionnaire into the national language of Pakistan for the convenience of the respondents and to maintain quality of data (Doerr, 2009; Xian, 2008). Following the translation/back-translation guidelines of Sousa and Rojjanasrirat (2011), the items were first translated into Urdu by 2 experts, and then back-translated by 2 different experts to ensure consistency and accuracy. Finally, the translated version was administered for pilot testing to 40 university students at postgraduate level (age: 25–35 years; gender: 17 females and 23 male; language proficiency (English): 33 'high', 7 'moderate'; language proficiency (Urdu): 38 'high', 2 'moderate'). Of the total 40 respondents, 32 (80%) acknowledged that the instructions, items, sentence structure and the response scale were clear. Five (12.5%) found that instructions were convoluted, while the remaining 3 (7.5%) objected to using 5-points as response scale. Necessary modifications were made before the final translated instrument was administered to 250 respondents in study 1.

4.4. Study 1: Item purification

Before implementing the actual study, we conducted a pilot survey to reduce the number of items to a manageable size. Pilot testing was conducted on a sample of 250 customers selected randomly from 7 dealerships of Toyota Motors, Honda Atlas Motors and Pak Suzuki Motors, all situated in the Multan district. Respondents were provided with a 51-item translated version of the questionnaire at the dealership and were requested to indicate on a 7-point scale (1 = "strongly disagree", 7 = "strongly agree") the extent to which they agreed with the statements regarding purchase and use of personal cars. Additionally, demographic details were obtained including age, gender, income, education, and marital status. Analysis of the data was conducted using IBM SPSS 23.0.

We received 174 useable responses, with a response rate of 69.6%. About 86.2%of the respondents belonged to age bracket of 19–40 years (30.5%in 19–26 years; 33.9%in 27–33 and 21.8%in 34–40), 78.2% were male and 21.8% female, 50%each had marital status single or married and about 77.6%belonged to the monthly income bracket of Pak Rupee 45,000–85,000 (USD $ 450–850). The majority of respondents were of a highly educated background, with about 33.3% having MPhil degrees (18 years of education) and another 33.3%having obtained a Master degree (16 years of education), which corresponds to growing trends in higher education across the country (Khattak, 2017).

After analyzing demographics, inter-item correlation of the initial pool of items was calculated. Preliminary screening of items was carried out using the criteria of corrected item-total correlation and the items below the cut-off value of 0.40 were dropped in sequential iterations (Clark and Watson, 1995; Loo, 2002; Nunnally, 1978). The process resulted in a final 22-item scale with each item having satisfactory corrected item-total correlations. A summary of the corrected item-total correlation is provided in Table 2.

4.5. Study 2: Validity and reliability assessment

4.5.1. Sample and data collection

Data for this study was collected from customers of Toyota Motors, Honda Atlas Motors and Pak Suzuki Motors across 112 dealerships nationwide. A proportionate stratified random sampling technique was employed to recruit the respondents. This technique provides liberty to divide the target population into various groups based on one or more population characteristics, which form the basis of homogeneity within group and heterogeneity between groups resulting in a better sample representation and, consequently, greater potential for generalizability of the study results (Adams et al., 2007; Zikmund et al., 2013). A total of 1200 respondents were randomly chosen from the aforementioned dealerships located in 11 different cities of Pakistan.

The survey was administered with the help of 24 survey assistants studying for business administration degrees at a national university. All had past experience in data collection and volunteered to assist for a fixed compensation. Prior permission was sought from the university to recruit the students, who were provided with a 2-day training about the scope of the study and peculiarities of the survey. Prior to actual collection of data, permissions were sought from the dealerships and arrangement were made to facilitate the interaction of survey assistants with customers at automobile dealerships. Before actual presentation of the survey instrument, respondents were provided with an information sheet which outlined the scope of the study. Respondents were requested to answer the survey questions, keeping in mind the project background given in information sheet. Data collection was carried out from April 18, 2017 to May 05, 2017.

The questionnaire for this study included 3 sections: demographic information, 22 items related to the ESCCB scale taken from study 1, and 15 items related to the construct of environmental concern. Environmental concern is a 3 dimensional scale including egoistic, altruistic, and biospheric values. For measurement, a 5-item Likert based scale for each dimension was adopted from literature (Snelgar, 2006; Stern et al., 1999). Response on subscales of environmental concern later helped in establishing nomological validity of the ESCCB scale which is discussed in Study 3.

Of the total 1200 surveys distributed, 771 usable responses were received constituting a response rate of 64.25 percent, which is acceptable in such studies (Baruch, 1999). Consumer responses were randomly split into sub-samples for validation of convergent, discriminant and nomological validity (Kumar and Nayak, 2014; Pan et al., 2017) using the IBM SPSS 23.0 random sample selection

Table 2
Corrected item-total correlation – pilot study (N = 174).

Item	Description	Corrected Item-Total Correlation		Status
		First iteration	Final iteration	
ESCCBP1	I select a car with a high rear axle ratio for that produces least friction and save energy	0.456	0.488	Retained
ESCCBP2	I select a car with overdrive transmission to get improved fuel efficiency	0.372	–	Deleted
ESCCBP3	I avoid permanent roof racks on the car for that creates more air friction and cause to use more fuel	0.376	–	Deleted
ESCCBP4	I avoid wide thread tires for that cause road friction and consume more fuel	0.503	0.590	Retained
ESCCBP5	I consider using radial tires for that help to preserve fuel resource	0.511	0.572	Retained
ESCCBP6	If I have multiple car purchases available, given all other factors same, I choose the one with better environmental performance	0.495	0.559	Retained
ESCCBP7	I avoid purchasing car with power consuming accessories to save energy resource	0.475	0.491	Retained
ESCCBP8	If available, I prefer to purchase hybrid car as it saves fuel	0.310	–	Deleted
ESCCBP9	If available, I can consider purchasing electric car as that saves fuel	0.391	–	Deleted
ESCCBP10	I prefer buying a car with automatic transmission as it consumers less petrol	0.558	0.611	Retained
ESCCBP11	I prefer buying car with environmental certification	0.291	–	Deleted
ESCCBP12	I prefer buying car with claims of better environmental performance	0.349	–	Deleted
ESCCBP13	I prefer to buy the brand which considers environmental protection in manufacturing process	0.488	0.544	Retained
ESCCBP14	I prefer buying car brand which considers environmental protection in delivering the cars to consumers	0.317	–	Deleted
ESCCBP15	I prefer buying car brand which considers environmental protection in product marketing	0.267	–	Deleted
ESCCBP16	I would buy an electric vehicle even if its quality is lower than a conventional car	0.458	0.562	Retained
ESCCBP17	I would buy an electric vehicle even if its performance is lower than a conventional car	0.567	0.627	Retained
ESCCBP18	I would buy an electric vehicle even if it has a less appealing design	0.569	0.678	Retained
ESCCBP19	While buying a car, I take into consideration the emission levels	0.519	0.624	Retained
ESCCBP20	I plan to buy a Small Displacement Car (SDC)	0.514	0.562	Retained
ESCCBP21	I am willing to buy an SDC when I decide to buy	0.313	–	Deleted
ESCCBP22	I am willing to buy an SDC although it's small and not luxury looking.	0.227	–	Deleted
ESCCBP23	I am willing to buy an SDC although it's not as comfortable as a larger car.	0.341	–	Deleted
ESCCBP24	I would like to buy an SDC to reduce air pollutant emission	0.383	–	Deleted
ESCCBP25	I would like to buy an SDC as a responsible consumer	0.538	0.616	Retained
ESCCBP26	I wouldn't buy a car that I expect will damage the environment	0.540	0.642	Retained
ESCCBU1	Knowing that excessive speed is inefficient and requires more energy to stop the car, I consider observing speed limits	0.490	0.514	Retained
ESCCBU2	Knowing that excessive speed is inefficient and requires more energy to stop the car, I consider observing steady pace	0.477	0.483	Retained
ESCCBU3	I avoid tailgating to ensure that I drive in economic modes	0.380	–	Deleted
ESCCBU4	I avoid using air-conditioning as much as possible to save fuel for environmental reasons	0.434	0.516	Retained
ESCCBU5	I avoid using unnecessary brakes to avoid fuel loss	0.506	0.679	Retained
ESCCBU6	I change oil regularly to ensure that vehicle remains environment friendly	0.389	–	Deleted
ESCCBU7	I maintain regular car check-ups to ensure that it remains environment friendly	0.374	–	Deleted
ESCCBU8	I ensure that my vehicle is road worthy and environment friendly	0.317	–	Deleted
ESCCBU9	I regularly replace oil and air filters to ensure that my car remains environment friendly	0.318	–	Deleted
ESCCBU10	I wisely plan routes to avoid traffic congestion for environmental reasons	0.370	–	Deleted
ESCCBU11	I use public transport whenever possible to avoid harmful effects of car use on environment	0.339	–	Deleted
ESCCBU12	I use bicycle whenever possible to avoid harmful effects of car use on environment	0.318	–	Deleted
ESCCBU13	I often use telephonic communication to avoid transportation use for environmental reasons	0.450	0.504	Retained
ESCCBU14	I often use video conferencing to avoid transportation use for environmental reasons	0.396	–	Deleted
ESCCBU15	I do not use extra weight in car trunk to avoid extra fuel use	0.336	–	Deleted
ESCCBU16	I walk for short distances to save fuel consumption	0.382	–	Deleted
ESCCBU17	I always consider fuel economy while driving	0.543	0.533	Retained
ESCCBU18	I constantly monitor fuel mileage to ensure that I conserve fuel in car transportation	0.385	–	Deleted
ESCCBU19	I prefer riding a bicycle than driving for short distances	0.370	–	Deleted
ESCCBU20	I prefer taking public transport than using my car for short distances	0.378	–	Deleted
ESCCBU21	I try to keep my car as ecologically sound as possible	0.540	0.649	Retained
ESCCBU22	Even on freeways I drive under 60 to conserve fuel	0.558	0.657	Retained
ESCCBU23	Usually I do not drive my car on weekends when there is rush of cars	0.377	–	Deleted
ESCCBU24	I usually give way to other drivers rather than cutting them off	0.276	–	Deleted
ESCCBU25	I often do carpooling for transportation	0.185	–	Deleted

utility. First, a sub-sample of 400 respondents was utilized to perform EFA and CFA. To estimate nomological validity, we utilized a second sub-sample (549 respondents).

4.5.2. Test of common method variance, missing values and non-response bias

Considering that data on all items was captured through single source, and making an allowance for the recommendations of Richardson et al. (2009), common method bias was tested by employing Harman one factor technique. The principal component analysis revealed that six factors emerged with a total explained variance of 58%, however, none of the factors accounted for major

Table 3
Demographic statistics of the respondents – main study.

Variable	Category	Distribution	
		Frequency	Percentage
Age Group	19–26	260	33.7
	27–33	223	28.9
	34–40	177	23.0
	41–47	88	11.4
	48–54	17	2.2
	55 and above	6	0.8
Gender	Male	542	70.3
	Female	229	29.7
Monthly Income[a]	45,000–55,000	298	38.7
	56,000–65,000	135	17.5
	66,000–75,000	116	15.0
	76,000–85,000	75	9.7
	86,000–95,000	34	4.4
	96,000–105,000	25	3.2
	106,000 and above	88	11.4
Education	No formal Education	5	0.6
	Primary (year 5)	8	1.0
	Secondary School Certificate	33	4.3
	Higher Secondary School Certificate (HSSC)	25	3.2
	DAE	19	2.5
	Bachelors (year 14)	120	15.6
	Masters (year 16)	253	32.8
	MPhil (year 18)	207	26.8
	DVM	14	1.8
	MBBS or BDS	34	4.4
	Bachelors of Engineering	35	4.5
	Others	18	2.3

Note: N = 771.
[a] Income is given in Pakistan rupee (PKR); DAE: Diploma of associate of engineering; MBBS: Bachelor of medicine and bachelor of surgery; BDS: Bachelors of dental surgery; DVM: Doctor of veterinary medicine.

variance confirming that common method bias was not an issue. Further validation was done through specifying a structural equation model of the items with an unmeasured common latent factor (CLF). Comparison showed that there were no significant differences between standardized regression weights of the both models (with and without CLF), further endorsing the inexistence of common method variance (Podsakoff et al., 2012).

In line with the approaches suggested and utilized in literature (Flatten et al., 2011; Newman, 2003), we examined the missing values in the data. Because of the data collection methodology adopted in this study involving research assistants who personally administered the data collection process, only 3% missing values were found in the completed questionnaires and were estimated by following the full information maximum likelihood (FIML) procedure.

Finally, to verify that the responding sample is representative and that non-response bias doesn't pose any serious threat to the generalizability of the study results, the suggestions of Clottey and Grawe (2014) were followed. Comparison of the early (n = 475) and the late respondents (n = 296) on the initial 22-items (presented in Table 2) resulted in no statistically significant differences, thus confirming that non-response bias was not an issue.

4.5.3. Demographic characteristics of the respondents

Before splitting the data in sub-samples, respondents' characteristics were analyzed. Demographic profiles are summarized in Table 3. Corresponding to the results of the pilot study, almost 85 percent of the respondents were between 19 and 40 years (33.7% were 19–26; 28.9% were 27–33 and 23.0% were 34–40) which matches the overall demographic profile of the country (Countrymeters, 2017). Male respondents considerably outnumbered female respondents (70.3% vs. 29.7%), which is significantly different from the national gender distribution (World Population Review, 2017): a not unexpected result in a conservative society like Pakistan where involvement of females is relatively less than that of males in the purchasing of high-involvement products. In relation to education, 15.6% of the respondents had undergraduate degrees, 32.8% had completed their Masters, while 26.8% held MPhil degrees.

4.5.4. Exploratory Factor Analysis (EFA) and dimensionality assessment

Bearing in mind that ESCCB is a new scale and that its underlying dimensions might be correlated, a series of principal axis factoring (PAF) with Promax rotation were iteratively carried out (Hair, 2010; Netemeyer et al., 2003). The appropriateness of the 400 responses for factor analyses was established through the Kaiser-Meyer-Olkin (KMO) measure, which was far above (KMO = 0.782) the cut off value of 0.50 (Kaiser, 1974), indicating desirable sampling adequacy. Also, sufficient correlations between

Table 4
Factorial structure of the proposed ESCCB scale.[a]

Items	Description	Factor1	Factor 2	Factor 3
ESCCB 1	I select a car with a high rear axle ration for that produces least friction and saves energy	0.665		
ESCCB 2	I avoid using wide thread tires for that cause road friction and consume more fuel	0.854		
ESCCB 3	I consider using radial tires for that help to preserve fuel resource	0.683		
ESCCB 15	Knowing that excessive speed is inefficient and requires more energy to stop the car, I consider observing speed limits		0.588	
ESCCB 16	Knowing that excessive speed is inefficient and requires more energy to stop the car, I consider observing steady pace		0.968	
ESCCB17	I always consider fuel economy while driving		0.550	
ESCCB 8	I would buy an electric vehicle even if its quality is lower than a conventional car			0.730
ESCCB 9	I would buy an electric vehicle even if its performance is lower than a conventional car			0.901
ESCCB 10	I would buy an electric vehicle even if it has a less appealing design			0.534
Cronbach Alpha (α)		0.775	0.743	0.784
Eigen Values		3.614	1.342	1.320
Total Scale Reliability		0.812		
Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy		0.782		
Bartlett's Test		0.000		
Total Variance Explained		56.64%		

[a] Principal Axis Factoring (PAF) conducted with Promax Rotation.

the variables were evident from the Bartlett's test of Sphericity which was significant ($p < .001$). Initially, items were examined based on their communalities and those having communality lower than the cut-off point of 0.50 (Kaiser, 1960) were sequentially deleted. Further reduction of items was carried out based on factor loadings. The items with low factor loading (< 0.60) or high cross loading (> 0.50) were deleted one at a time to ensure accuracy (Hair, 2010; Nunnally, 1978). After several iterations, a total of 9 items converging on 3 factors, remained in the ESCCB scale. All factors had Eigen values greater than 1 (factor1 = 3.61, factor2 = 1.34, factor3 = 1.32), and explained 56.64% of the total variance, which exceeded the suggested criteria of 50% (Hair, 2010; Yong and Pearce, 2013). The Cronbach alpha (α) calculated for each factor was greater than 0.70 ($\alpha_{factor1} = 0.775$, $\alpha_{factor2} = 0.743$, $\alpha_{factor3} = 0.784$) indicating substantial internal consistency within each dimension (Nunnally, 1994). Based on the results of EFA reported in Table 4 and our theoretical conceptualization of the ESCCB scale, an examination of items comprising each factor led us to name the factors as follows: eco-social conservation, eco-social use, and eco-social purchase.

4.5.5. Confirmatory Factor Analysis (CFA), construct validity and reliability

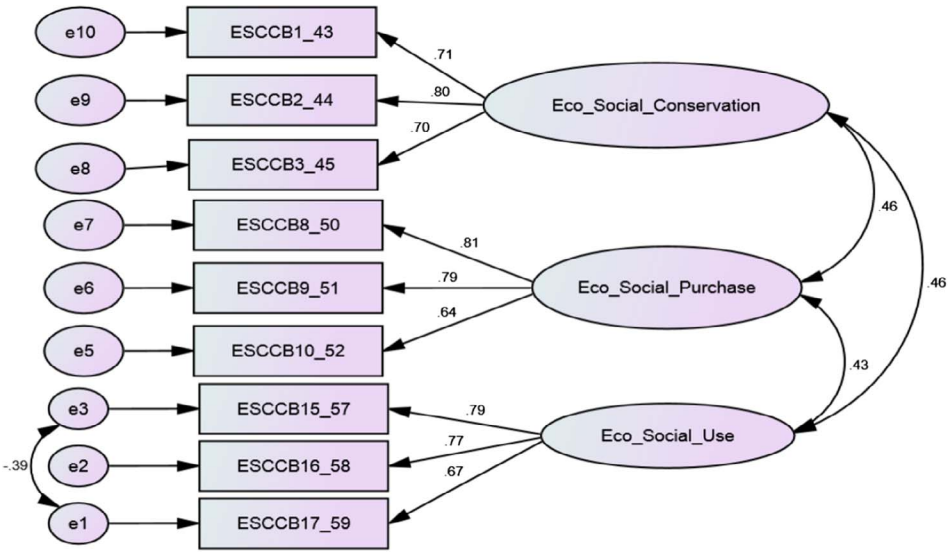
Subsequent to EFA, confirmatory factor analyses using AMOS 23.0 were conducted with maximum likelihood method of estimation (Byrne, 2013). In this study, we specified 3 measurement models:

- *Model 1(one-factor model):* ESCCB specified as a uni-dimensional construct with 3 sub factors. The covariance among the 9 items can be accounted by a single factor.
- *Model 2 (two-correlated-factors model):* ESCCB specified as a multi-dimensional construct underlying 2 first-order factors. Covariance among the items can be accounted for by 2 restricted first-order factors, each representing unique dimension of ESCCB. Factor 1 consisted of 5 correlated items, while factor 2 consisted of 4 correlated items.
- *Model 3 (three-correlated-factors model):* ESCCB specified as a multi-dimensional construct underlying 3 restricted first-order factors, which accounted for covariance among 9 items under 3 unique dimensions of ESCCB.

We followed the recommendations of Hooper et al. (2008) and utilized 3 categories of model fit indices as a benchmark: absolute measures (GFI ≥ 0.90, RMSEA: 0.05–0.08), incremental fit measures (CFI ≥ 0.90, NFI ≥ 0.90, TLI ≥ 0.90), and parsimonious fit measures (AGFI ≥ 0.90, χ^2/df ≤ 5). Results of the CFA reported in Table 5 indicate that one-factor model reflected a poor fit of data. Together with the one-factor model, the two-factor model also reproduced marginal fit, with certain indices not satisfying the ideal model fit criteria. Moreover, examination of estimates showed that many indicators reflected poor loading, i.e. λ ≤ 0.50 (Byrne, 2013), compelling us to delete the items, which ultimately resulted in poor factorial specification and an inadmissible solution. However, the three-factor model highlighted excellent model fit, with fit indices exceeding the expected standard criteria. The model fitting process allowed us to examine modification indices (MIs) which helped to uncover some discrepancies between proposed and

Table 5
Comparison of measurement model fit indices (N = 400).

Model	χ^2	χ^2/Df	GFI	AGFI	CFI	NFI	TLI/NNFI	RMSEA
One-factor Model	83.081	4.154	0.958	0.905	0.947	0.933	0.905	0.089
Two-factor Model	73.598	3.874	0.962	0.911	0.954	0.940	0.914	0.085
Three-factor Model	74.86	3.255	0.963	0.927	0.957	0.925	0.932	0.075



$\chi^2 = 74.86$, $\chi^2/Df = 3.255$, GFI = 0.963, RMSEA = 0.075, CFI = 0.957, TLI = 0.932, NFI = 0.925, AGFI = 0.927

Fig. 1. Three-factor measurement model of ESCCB.

estimated models (Hayduk et al., 2007). Based on higher values of MIs, a pair of items (ESCCB15 and ESCCB17) on the same dimension (Eco-social use) were allowed to covariate, which is conceptually plausible as both indicators measure same construct (Byrne, 2013; Das, 2014). This process of covariation resulted in improvement of model estimates. The standardized factor loadings of the three-factor model were all substantial and statistically significant. The estimated model is given in Fig. 1.

4.5.6. Reliability assessment

Construct reliability refers to the degree to which the instrument consistently measures the intended phenomenon and repeatedly provides identical results (Nunnally, 1994). Construct reliability can be computed by using the formula suggested by Fornell and Larcker (1981) as follows:

$$\text{Construct reliability(CR)} = \frac{(\sum_{i=1}^{n} \lambda_i)^2}{(\sum_{i=1}^{n} \lambda_i)^2 + (\sum \delta_i)}$$

where λ_i is the standardized loading and δ_i is the measurement error of each item.

The reliability coefficients for the 3 subscales of ESCCB range from 0.781 to 0.796 and are reported in Table 6. The estimates meet the standard criteria ($\alpha \geq 0.7$) suggested by Nunnally (1978) and confirm that the scale is reliable.

4.5.7. Convergent and discriminant validity

The validity of a construct refers to its ability to measure what it is meant to measure (Clark and Watson, 1995; Cronbach and

Table 6
Measurement model properties of the 9-item ESCCB scale (N = 400).

Factor and Items	λ[a]	AVE	CR	Eco-Social Conservation	Eco-Social Use	Eco-Social Purchase
Eco-Social Conservation		0.544	0.781	***0.737***		
ESCCB 1	0.712					
ESCCB 2	0.798					
ESCCB 3	0.698					
Eco-Social Use		0.557	0.789	0.455	***0.759***	
ESCCB 15	0.793					
ESCCB 16	0.769					
ESCCB 17	0.671					
Eco-Social Purchase		0.568	0.796	0.461	0.426	***0.754***
ESCCB 8	0.815					
ESCCB 9	0.794					
ESCCB 10	0.639					

[a] Standardised factor loadings were all significant at $p < .01$; AVE: Average variance extracted; CR: Construct reliability; items on diagonal given in bold and italic are square root of AVEs; items off the diagonal are squared multiple correlations between dimensions and are significant at $p < 05$.

Meehl, 1955). Convergent and discriminant validities are of important concern in measurement model validation. The degree to which underlying measures of a factor reflect their respective construct is known as convergent validity (Churchill, 1979; Hair, 2010). Measures of the construct which load with satisfactory weight ($\lambda > 0.5$) to their respective factors attest convergent validity of the construct (Wixom and Watson, 2001). Furthermore, average variance extracted (AVE) from the factors exceeding 0.5 also reflects that convergent validity is ensured. Table 6 reports factor loadings and AVEs of subscales of ESCCB (AVEs ranging from 0.544 to 0.568), which confirm that convergent validity of the scales is established. Discriminant validity refers to the concept that dissimilar constructs behave differently from each other (Burns and Bush, 2000). According to the criteria stated by Churchill (1979), square roots of AVEs of constructs should be greater than squared multiple correlations to ascertain discriminant validity. Comparison of square root of AVEs and squared multiple correlations of constructs reported in Table 6 indicates that correlations among the factors are lower than correlations between the items or measures of a factor, hence, discriminant validity is confirmed.

4.5.8. Higher order models of ESCCB

After having identified 3 correlated but conceptually and statistically distinct dimensions of ESCCB, two second-order models were specified.

- *Model 1(reflective - reflective type):* First higher order model was specified as 'reflective first order, reflective second order' considering that eco-social purchase, eco-social use and eco-social conservation are manifestations of ESCCB and change in ESCCB brings change in its dimensions (MacKenzie et al., 2011; Polites et al., 2012; Varshneya and Das, 2017). The model highlighted a causal flow from higher order construct (ESCCB) to the 3 first-order latent factors, positing that ESCCB is manifested in 3 latent factors wherein each factor is reflected by 3 items. This approach has been widely used in most recent studies (for instance, see Tanwar and Prasad, 2017) and has been recommended in the literature regarding classical theory of structural equation modelling for reflective constructs (Bowen and Guo, 2012; Byrne, 2013; Hair, 2010).

The results of the above stated estimated model indicate excellent fit indices as shown in Fig. 2. The estimates of the model confirm the existence of second-order factor as all first-order latent variables correlated significantly and substantially with the higher order construct (eco-social conservation: $\beta = 0.701$, $p < .01$; eco-social use: $\beta = 0.657$, $p < .01$ and eco-social purchase: $\beta = 0.649$, $p < .01$).

- *Model 2 (reflective-formative type):* Second higher order model of ESCCB was specified as 'reflective first order, formative second order' bearing in mind that eco-social conservation, eco-social use and eco-social purchase act as the indicators of ESCCB and change in any of these dimensions tend to bring change in ESCCB. Such conceptualization of higher order constructs is common in behavioral science and has been proposed by many researchers (Flatten et al., 2011; Mas'ud et al., 2017). The proposed model was evaluated by using PLS-SEM version 3.0.

Model estimates reported in Fig. 3 show that all three dimensions contributed significantly to the formation of ESCCB (eco-social conservation: $\beta = 0.446$, $p < .01$; eco-social use: $\beta = 0.4.3$, $p < .01$ and eco-social purchase: $\beta = 0.456$, $p < .01$). Quality of the second order reflective-formative model was assessed against three criteria: (1) weights of first order constructs, (2) examination of multicollinearity by variance inflation factor (VIF) and (3) discriminant validity based on multitrait-multi methods matrix. Estimates of the first order constructs, contributing towards formation of ESCCB, were all substantial (> 0.10) and consistent with underlying theory (all contributed positively towards formation of ESCCB), thus, first criteria is met (Hair et al., 2012). Examination of

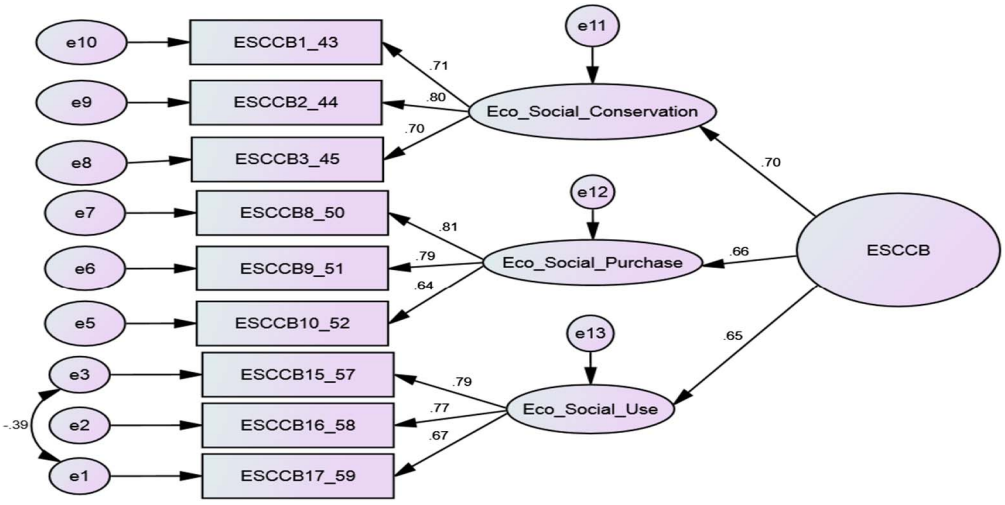


Fig. 2. Second order (reflective-reflective) factor structure of ESCCB.

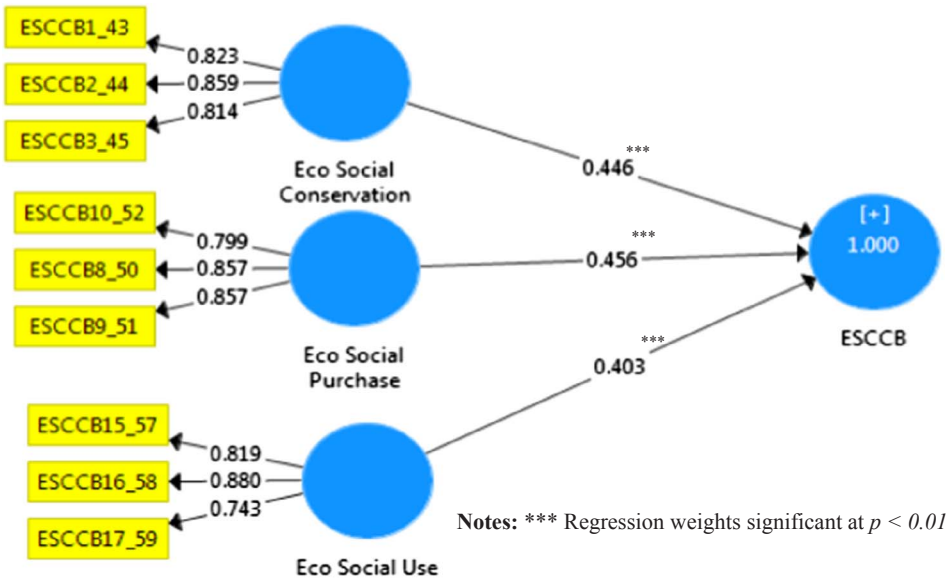


Fig. 3. Second Order (reflective-formative) factor structure of ESCCB.

multicollinearity showed that the VIF values of first order constructs ranged from 1.23 to 1.28 which is far below the common cut-off threshold of 5 (Hair et al., 2012), suggesting that first order constructs are tapping into different aspects of the ESCCB. Finally, discriminant validity of the model was tested using heterotrait-monotrait (HTMT) ration of correlations among the first order constructs (Henseler et al., 2015). HTMT compares the correlations of indicators within constructs (monotrait-heteromethod correlation) with correlations of indicators across constructs (heterotrait-heteromethod correlations) and the resulting ration must be lower than the restrictive threshold of 0.85 to indicate discriminant validity (Amaro and Duarte, 2016; Kline, 2011). HTMT values reported in Table 7 show that discriminant validity is established.

4.6. Study 3: The nomological validity of the ESCCB scale

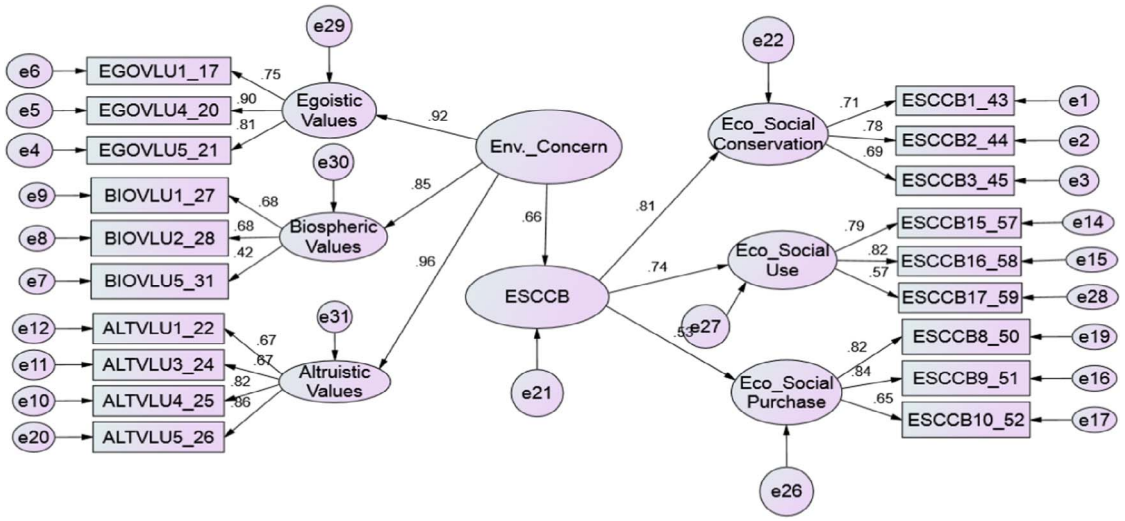
While theoretical foundations and statistical evidence support the concept of ESCCB, another means of advancing its plausibility is identifying the behavior of ESCCB in its nomological net of antecedents. Nomological validity proposes comparison of 2 related constructs and confirmation of their relationship as theorized in literature to ensure that new construct '*behaves as it is expected*' (Curcuruto et al., 2016; Davis and Cernas Ortiz, 2017; Howell and Buro, 2017).

There is reason to expect a positive relationship between environmental values, manifested in the environmental concern construct, and ESCCB. Environmental concern refers to the degree to which individuals evaluate their own behavior, or that of others, and develop an attitude based on facts about the environment (Chen, 2015; Fransson and Garling, 1999). Egoistic, altruistic, and biospheric values are constituents of environmental concern (Snelgar, 2006). Egoistic values compel individuals to pursue self-interest and behave in a way to achieve self-gratification (De Groot and Steg, 2008; Snelgar, 2006). These values help to promote general pro-environmental behavior if individuals' personal satisfaction is embedded in environmental protection (Stern et al., 1993, 1995), however, in case of more specific pro-environmental behaviors like ESCCB, we expect to observe weak statistical association. Similarly, altruistic values evoke selflessness and helping behavior for others and may raise general pro-environmental intentions (Albayrak et al., 2013), but we assume that very specific behaviors like ESCCB may not significantly converge in statistical associations. Contrarily, biospheric values are specifically related to the environment (Albayrak et al., 2013; Rhead et al., 2015) and are expected to be highly associated with ESCCB. Given these theroretical conceptualisations, we specified and tested 2 models to verify

Table 7
Discriminant validity of higher order model using HTMT.

Variables	Eco-Social Conservation	Eco-Social Purchase	Eco-Social Use
Eco-Social Conservation	***1.27***		
Eco-Social Purchase	0.517 CI_{90} (0.399, 0.624)	***1.28***	
Eco-Social Use	0.464 CI_{90} (0.339, 0.572)	0.479 CI_{90} (0.352, 0.584)	***1.23***

Notes: CI, confidence interval; values in parenthesis report bias corrected lower level and upper level confidence intervals for $HTMT_{90;}$ Values on the diagonal, in bold and italic are VIF for the constructs.



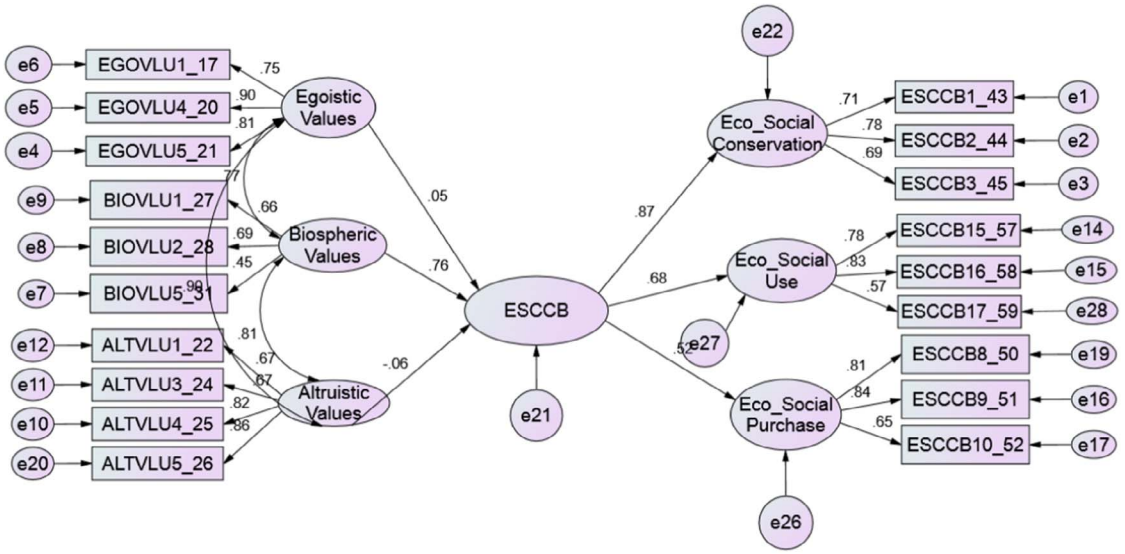
$\chi^2 = 450.733$, $Df = 145$, $\chi^2/Df = 3.109$, GFI = 0.921, CFI = 0.937, TLI = 0.925, NFI = 0.910, RMSEA = 0.062

Fig. 4. Nomological Model1a of ESCCB.

the nomological behavior of ESCCB,

- *Model 1a:* The first model specified for nomological validity of ESCCB followed theorizing environmental concern as a composite variables of 3 underlying dimensions: namely, altruistic values, egoistic values, and biospheric values. Environmental concern was taken as a predictor, expected to have a positive effect on ESCCB as supported by the literature (Bertrandias and Elgaaied-Gambier, 2014; Jekria and Daud, 2016; Newton et al., 2015).
- *Model 1b:* The second model specified for nomological validity of ESCCB conceptualized altruistic values, egoistic values, and biospheric values as 3 unique first order constructs individually affecting ESCCB in different ways. Based on evidence from the literature, it was expected that only biospheric values will positively affect ESCCB, while altruistic and egoistic values will remain insignificant (Albayrak et al., 2013; Lau et al., 2016; Rhead et al., 2015).

Analysis revealed that the data of this study had satisfactory level of fit for both models as highlighted in Figs. 4 and 5. Estimates of the first model, Model 1a, showed that environmental concern as a composite construct of egoistic, altruistic, and biospheric values



$\chi^2 = 425.591$, $Df = 143$, $\chi^2/Df = 2.976$, GFI = 0.926, CFI = 0.926, TLI = 0.930, NFI = 0.915, RMSEA = 0.060

Fig. 5. Nomological Model1b of ESCCB.

Table 8
Nomological behavior of the ESCCB scale (N = 549).

Predictors	Model 1a				Model 1b				Nomological behavior
	β	*S.E*	*t*	*p*	*β*	*S.E*	*t*	*p*	
Environmental Concern	0.664	0.058	9.748	0.000	–	–	–		As expected
Egoistic Values	–	–	–	–	0.049	0.136	0.310	0.756	As expected
Biospheric Values	–	–	–	–	0.757	0.254	4.483	0.000	As expected
Altruistic Values	–	–	–	–	−0.064	0.160	−0.330	0.741	As expected

was positively associated with ESCCB ($\beta = 0.664$, $t = 9.748$, $p < .01$) which corroborated with our expectations and literature evidence, thus, confirming the nomological validity of newly developed ESCCB construct. Additionally, the estimates of the second model, Model 1b, also confirmed the existence of nomological validity as biospheric, egoistic, and altruistic values associated with ESCCB as expected in the literature (Biospheric values: $\beta = 0.757$, $t = 4.483$, $p < .01$; Egoistic values: $\beta = 0.049$, $t = 0.310$, $p = .75$; Altruistic values: $\beta = -0.064$, $t = -0.330$, $p = .741$). The estimates of the both models are reported in Table 8.

5. Discussion

This paper reports a series of studies on development and validation of the ESCCB scale designed to measure consumer behavior towards purchase and use of personal cars in the specific socio-cultural context of an emerging economy. The current study fills a gap in the literature by establishing a customized measure to capture consumer behavioral intentions related to one of the most influential human activities affecting climate change, purchase and use of personal cars. The scale development process resulted in a 9-item measure with 3 dimensions, achieving satisfactory internal reliability for the whole scale ($\alpha = 0.812$) and for all the individual factors (see Table 4). The alpha levels suggest that scale items are ideally correlated and the underlying factors are adequately distinct to develop the 3 different dimensions representing the ESCCB scale (Nunnally, 1978; Streiner, 2003). A test of validity further supported that each dimension reflected satisfactorily on its higher order construct (AVEs > 0.5) and demonstrated individual distinctiveness ($R^2 < \sqrt{AVEs}$) (Fornell and Larcker, 1981). We believe that this is the first study of its kind to provide a comprehensive measure of consumer behavior related to purchase and use of personal cars demonstrating psychometric rigor and operationally valid results on a national sample. Most previous studies in related areas either emphasize general pro-environmental behaviors (Dunlap, 2008; Tilikidou, 2013) or inadequately address the issue of purchase and use of personal cars (Armel et al., 2011; Kaiser and Wilson, 2000; Markle, 2013), leaving conceptual and methodological gaps. The current study extended the existing literature to improve understanding of an important category of climate change behaviors – purchase and use of personal cars.

Interestingly, the second order model of ESCCB (Model 1b) revealed that “eco-social purchase” was the most significant dimension of ESCCB ($\beta = 0.456$). Eco-social purchase consisted of items focussed on consumers’ purchase of an electric vehicle, which was seemingly unexpected in the context of a country where an energy crisis is at its peak. However, hybrid car sales in Pakistan suggests that there is an increasing inclination on the part of consumers towards purchase of alternate fuel vehicles irrespective of operational costs and infrastructural hurdles (Khan, 2015). This indicates that investment in infrastructure to facilitate electric car use holds great potential both from the perspective of high potential business returns and environmental protection via the reduction of CO_2 emissions (Dimitropoulos et al., 2016; Klöckner et al., 2013).

Next, the “eco-social conservation” proved to be the second most significant dimension ($\beta = 0.446$). This evinces that consumers prefer to buy an auto brand that gives maximum fuel efficiency and are concerned about consumption and mileage. This preference is reflected through findings regarding consumers’ disposition towards the purchase of a car with high rear axle ratio and tires that create the least possible friction to ensure that less fuel is consumed. Considerations related to fuel efficiency can help in reducing CO_2 emissions which is, by far, the most significant contributor to global warming and climate change (De Richter et al., 2016; Montag, 2015).

Finally, “eco-social use” was the third important dimension of the ESSCB scale ($\beta = 0.403$), characterised by items including environment friendly alternative appraisal for travelling, driving at lower speeds, and maintaining a steady driving pace. This showed high concern of consumers towards ecologically oriented use of the personal cars which is important from an environmental perspective. As York (2006) and Galvin (2016) suggest, use of environmentally-friendly technology alone may not help to reduce the negative effects of human activities on the environment, so responsible consumer behavior is instrumental in this respect - thus we may hold that eco-social use of cars is a way forward towards ethical consumption.

The nomological testing of the ESCCB scale against a related construct, environmental concern, showed significant positive relationship between the both constructs ($\beta = 0.67$, $t = 9.75$, $p < .01$), thus, supporting our assertion that ESCCB correlates with related constructs as expected in literature (Jekria and Daud, 2016). More specifically, we found that consumers with concern for the environment and biodiversity showed high positive inclination towards ESCCB ($\beta = 0.75$, $t = 4.48$, $p < .01$). These findings indicate that consumer groups with a pro-environmental inclination can be persuaded to purchase environmental friendly cars and pursue ethical car use.

In brief, the ESCCB inventory proposed and validated in this study attempts to integrate the fragmented explanations of personal car use and purchase, reflected as subscales or items of subscales presented in several existing works (Armel et al., 2011; Kaiser, 1998; Markle, 2013). The distinction of ESCCB lies in its focused approach towards personal car use and purchase behaviors. Therefore, this

scale can be utilized to assess eco-social use, conservation and purchase behaviors, especially in an era of unprecedented global commitments towards emissions reduction by decreasing personal car use and eliminating petrol and diesel cars (Swinford, 2017).

5.1. Academic and managerial implications

The current study offers both academic and practical contributions. Academically, this study advances the extant literature on pro-environmental behaviors and introduces a new perspective by integrating social and ecological behaviors, specified on purchase and use of personal cars. Our major academic contribution is a conceptualization of a somewhat elusive concept, that of ESCCB, and the offering of an integrative framework including actionable dimensions of eco-social conservation, eco-social purchase, and eco-social use of personal cars. Unlike previous measures mostly focused on general ecological behaviors, our scale specifically focuses on behaviors related to purchase and use of personal cars, thus providing a detailed account of this important pro-environmental behavior. We have provided empirical evidence resulting in a testable scale achieving satisfactory reliability and validity. The model of ESCCB obtained therefore provides useful foundations on which further theoretical and empirical research can be built across different cultures and contexts.

This new conceptualization of ESCCB can benefit several stakeholders of automobile industry in different ways. Recognizing the importance of effects of purchase and use of personal cars on the environment, the current study provides useful insights for automobile marketing practitioners and customers, government and NGOs. There are 2 important implications that marketing managers may consider while devising plans for existing and new brands of personal cars. First, as eco-social purchase is the most important factor of ESCCB, which is focused on the purchasing preference of consumers regarding electric vehicles, this presents an opportunity for automobile manufacturers to invest in this growing market. Especially, due to liberal government initiatives for automobile industry for 2016–2021 (EDB, 2016), which have created potentially lucrative investment opportunities in environment friendly vehicle market, investing into electric vehicle market can prove very successful. Second, eco-social conservation is the dimension which consumers regarded as the second most important factor. Therefore, marketing managers may develop marketing messages, intended to bolster perception of an automobile's environmental performance, by emphasizing on the vehicle's fuel conservation capability through its design and technological innovation (AFDC, 2017). Such messages are likely to increase prestige of brands which intend to build their image on environmental performance.

For NGOs focusing on climate change policy and environmental management program, the newly developed construct of ESCCB provides guidelines for some actionable strategies. The results indicated that the eco-social use dimension included items that were focused on socially responsible use of cars in terms of adhering to speed limits and choosing environmentally friendly alternatives to travel. Hence, social marketing campaigns may be designed in collaboration with local authorities to educate consumers with messages such as 'drive slow - drive safe' and 'protect life - save environment', to promote prosocial use of cars and reduce fuel use ultimately reducing the anti-environment impacts of personal cars usage.

Finally, policy makers and the government may consider about partnering with industry to invest in development of infrastructure for promotion of electric vehicles. Such long term initiatives may not only contribute to clean environment objectives but also boost growth in automobile sector eventually leading to increased governmental tax earnings.

5.2. Limitations and future research directions

Considering that this study is first attempt to develop and validate a framework of ESCCB related to purchase and use of personal cars, the findings presented may not be absolutely conclusive. This study has some limitations which offer other avenues for future research. First, this study utilized 2 data sets for scale development: the first data set for initial screening of item pools and the second for testing validity, including nomological behavior of the newly developed scale. Though the second data set was split into 2 subsamples to ensure that construct validity and nomological validity were based on different samples, using different data sets for scale development procedures would have been the optimal solution. Second, the Pakistani automobile industry is highly regulated, thus reducing consumers' choices. The ESCCB scale generated in such a context needs to be validated in countries with a much more liberal industry structure and consumer purchasing behavior that avails of greater choice in the market. For that purpose, the initial 22-items (see Table 2) may be utilized to confirm scale reliability and validity in different cultures. Finally, we used Kaiser (1974) criterion of Eigen values to determine the number of components underlying ESCCB construct which may understate the number of factors in certain cases. It is therefore suggested to use minimum average partial test (MAP) (Velicer, 1976) to cross validate the exact number of factors by using R-Menu v2.0 for SPSS (for detailed procedure, see Courtney, 2013). MAP test may be applied on 22-items initial pool reported in Table 2.

Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.trd.2017.12.023.

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